ADJUSTABLE-LENGTH TUBE, ESPECIALLY FOR STICKS

Description

The present invention relates to an adjustable-length tube, especially for sticks,[1] in accordance with the preamble of Claim 1.

In an adjustable-length tube such as is known from DE 297 06 849 U1, the spreading element is provided with a tapering inner cone oriented towards the inner tube, whereas the corresponding interior element that is provided with the outer cone is displaced towards the inner tube by the adjusting screw so that the spreading device can grab hold. In this manner, although the result is a relatively parallel clamping over the entire axial length of the spreading element, nevertheless it has been found that in response to impact-like stresses on the stick tip from the handle-side of an adjustable-length stick, an axial displacement of the outer tube with respect to the inner tube cannot always be avoided and especially not when, in the twisting motion, insufficient force has been applied for purposes of clamping.

Furthermore, from DE 297 08 829 U1, an adjustable-length tube is known, in which the interior element that is provided with the outer cone is formed by the forward free end of the adjusting screw, and the spreading element that is provided with the inner cone is moved axially on the adjusting screw. In this context, although the inner cone of the spreading element is opened towards the inner tube, nevertheless the same aforementioned disadvantages arise here if the spreading element is axially fixed in the spread-apart state. In this case as well, a relative motion between the outer tube and the spreading element can occur.

The objective of the present invention is to create an adjustable-length tube, especially for sticks, of the species cited above, which, in response to impact-like axial stresses, continues to clamp rather than slide or give way.

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[1] **Translator's note: The two reference patents cited on this page refer to "walking sticks and ski poles" but the present application only mentions "sticks" (Stoecke). I have translated the latter German word as "sticks" despite the fact that this word in English can have several other additional meanings (e.g., in sports, "hockey sticks").**

The features indicated in Claim 1 are put forward to achieve this objective in an adjustable-length tube, especially for sticks, of the aforementioned species.

As a result of the features according to the present invention, it is achieved that in response to an aforementioned impact-like stress, the holding force between the spreading element, or inner tube, and the outer tube is increased, because as a result of the relative axial movability of the interior element and the spreading element, the former is able to penetrate further into the inner cone of the spreading element. Even in the case of a telescope mechanism that is tightened using too little torque, the result is essentially a further spreading, which in turn reinforces the clamping force in the direction of the stress, so that even in these cases a displacement or a relative motion is prevented.

A jam-free guiding of the spreading element within the given axial movability is provided by the features as recited in Claim 2 and/or 3.

Advantageous embodiments with regard to the outer limit stop for the spreading element will become apparent from the features of Claim 4 or those of Claim 5. In the former case, the assembly of the spreading element takes place before the attachment of the outer limit stop, whereas in the latter case, with the limit stop already provided, the spreading element is configured such that it can be placed onto the adjusting screw and the interior element radially.

One advantageous embodiment of the inner limit stop will become apparent from the features as recited in Claim 6.

The features as recited in Claim 7 are put forward to achieve a rotationally fixed axial movability of the interior element with respect to the spreading element.

Further details of the present invention can be derived from the following description, in which the present invention is described in greater detail and is explained on the basis of the exemplary embodiments depicted in the drawing. In the latter:

Figure 1 in a partial longitudinal cutaway and truncated view depicts an adjustable-length tube according to a first exemplary embodiment of the present invention,

Figure 2 depicts a partial longitudinal cutaway view, rotated 90° with respect to Figure 1, of the first exemplary embodiment,

Figure 3 depicts a view along the line III-III of Figure 2,

Figure 4 depicts a representation corresponding to Figure 1, but in accordance with a second exemplary embodiment of the present invention, and

Figure 5 depicts a representation corresponding to Figure 2, but in accordance with the second exemplary embodiment of the present invention.

In the connecting segments of an adjustable-length tube 10, 110, depicted in the drawing in accordance with two exemplary embodiments, an inner tube 11, 111 is guided telescope-like in an outer tube 12,112. For this purpose, inner tube 11, 111, at its end 13, 113 that is facing outer tube 12, 112, is provided with a spreading device 15, 115, using which inner tube 11, 111 can be fixed at any position within the outer tube 12, 112 in a clamping manner.

Spreading device 15, 115 has an exterior element in the form of a spreading element 16, 116, an interior element 17, 117, and an adjusting screw, or externally threaded rod 18, 118. Externally threaded rod 18, 118, which is arranged in the axial direction of tube 10, 110, is supported at its one end area in a rotationally fixed manner on insertion end 13, 113 of inner tube 11, 111. For this purpose, externally threaded rod 18, 118 is inserted, or screwed, into an end plug 19, 119, or is integrally configured on the latter, or the like, and is axially fixed and held in a rotationally fixed manner in the end plug using adhesive or the like. End plug 19, 119 is also axially fixed and supported in a rotationally fixed manner in inner tube 11, 111.

Interior element 17, 117 by its axial central interior thread 21, 121 is screwed onto externally threaded rod 18, 118. Interior element 17, 117 is provided on its exterior side with a cone 22, 122, or it is configured in a conical manner. Outer cone 22, 122 tapers toward the free end of externally threaded rod 18, 118. Externally threaded rod 18, 118 penetrates internally threaded bore 21, 121 of interior element 17, 117 and is connected at its protruding free end in a rotationally fixed manner to an exterior limit stop 26, 126.

Exterior-side spreading element 16, 116 on its spreadable main body 23, 123 has an inner cone, or interior taper 27, 127, whose slope corresponds to that of outer cone, or exterior taper 22, 122 of interior element 17, 117. According to the graphic depiction, interior element 17, 117 is accommodated without play in spreading element 16, 116, which is oriented in the contrary direction, outer cone 22, 122 being shorter than inner cone 27, 127. In accordance with the depicted arrangement, inner cone, or interior taper 27, 127 of spreading element 16, 116 opens towards inner tube 11, 111. By way of example, spreading element 16, 116 can be made of plastic, and interior element 17, 117 can be made of metal or plastic.

Integral end plug 19, 119 is provided with an interior part 31, 131, which is supported in inner tube 11, 111 so as to be prevented from rotating or sliding, and a collar 32, 132, which lies on the annular end face of inner tube 11, 111. Protruding from collar 32, 132 is a guide piece 33, 133 for spreading element 16, 116, the guide piece having a smaller diameter than the latter.

Spreading element 16, 116 is roughly pot shaped, pot base 36, 136 having a through bore 37, 137, which is penetrated by the free end area of adjusting screw 18, 118. Pot base 36, 136 is axially movable relative to adjusting screw 18, 118. Main body 23, 123 of spreading element 16, 116, which on the exterior periphery can be provided with one or more friction linings, can be coated therewith, or can be configured through its surface composition (for example, longitudinal ribs) so as to achieve an increased frictional force with respect to the interior periphery of outer tube 12, 112, has, on its end facing away from pot base 36, 136 and facing inner tube 11, 111, a cylindrical shoulder 38, 138, that is smaller in its exterior diameter, in which guide piece 33, 133 can engage at its end side. In this context, between guide piece 33, 133 and spreading element 16, 116, enough play is available, so that the latter can move unhindered both axially and

radially. Therefore, spreading element 16, 116 is axially movable within narrow limits between outer limit stop 26, 126 on the free end of adjusting screw 18, 118 and an inner limit stop surface 28, 128, which is formed by the annular surface of collar 32, 132 around guide piece 33, 133. The distance between both limit stop surfaces 24, 124 and 28, 128 is somewhat greater than the axial length of spreading element 16, 116 between the exterior surface of pot base 36, 136 and the annular end face of cylindrical shoulder 38, 138.

In the exemplary embodiment of Figures 1 through 3, exterior limit stop 26 is formed by a cap 26', which is attached to the free end of adjusting screw 18, for example, by being screwed, pressed, glued, plastic-extruded, or attached in some other way. Cap 26' has a radial edge 24, which can come into contact with spreading element 16.

In the exemplary embodiment of Figures 4 and 5, exterior limit stop 126 is configured as a head 126' that is formed on the free end of adjusting screw 118, interior annular surface 124 of the head constituting the limit stop surface for spreading element 116.

Interior element 17, 117 on each of two diametrically opposite peripheral areas of outer cone 22, 122 has a fin 41, 42, and 141, 142, whose longitudinal end face runs parallel to the stick axis. Each fin 41, 42, and 141, 142 is axially guided in a correspondingly wide slot 43, 44, and 143, 144 of spreading element 16, 116. In this manner, when interior element 17, 117 moves axially relative to spreading element 16, 116, it cannot rotate with respect to the latter. Both slots 43, 44, and 143, 144 are provided essentially over the longitudinal extension of main body 23, 123 of spreading element 16, 116, i.e., they only penetrate into the area of cylindrical shoulder 38, 138 to an insignificant extent. In other words, this also means that the greatest radial dimension of diametrically opposite fins 41, 42, and 141, 142, is equal to the interior diameter of cylindrical shoulder 38, 138.

As can be seen from Figure 3, which essentially applies to both exemplary embodiments, spreading element 16, 116 is furnished on its exterior periphery with four notches 46 that are all axially and centrally symmetrical to each other, which run in the longitudinal direction and

extend over virtually the entire length of main body 23, 123 of spreading element 16, 116. Generated in this manner are defined, peripheral clamping areas of spreading element 16, 116.

In the exemplary embodiment of Figures 1 through 3, after spreading device 16 is fixed in inner tube 11, interior element 17 is screwed onto the free end of adjusting screw 18, and thereafter spreading element 16 is placed over adjusting screw 18. Subsequently, exterior limit stop 26 is attached at the protruding end of adjusting screw 18, after which the end of inner tube 11, which has been completed in this manner, can be inserted into outer tube 12.

In the exemplary embodiment of Figures 4 and 5, in which adjusting screw 118 has molded head 126' and in which interior element 117 is screwed from the other side of adjusting screw 118, before adjusting screw 118 has been fixedly joined to end plug 119, spreading element 116 (if it has not been threaded first) must subsequently be placed over adjusting screw 118 and interior element 117. For this purpose, spreading element 116 according to Figure 5 has an axially continuous slot 148, at which spreading element 116 can be opened radially and placed over interior element 117 and adjusting screw 118. In the depicted exemplary embodiment, continuous slot 148 is partially identical with one of slots 143, 144, although it is narrower in the area that extends further.

In response to the motion of clamping inner tube 111, 111 in outer tube 12, 112 using spreading device 15, 115, interior element 17, 117 is moved away from inner tube 11, 111 in the direction of arrow A by rotating inner tube 11, 111 and therefore adjusting screw 18, 118 to the right (in the case of a left-handed thread) or to the left (in the case of a right-handed thread) with respect to outer tube 12, 112, spreading element 16, 116 first being moved, or pushed, in the same direction up to exterior limit stop 26,126. Thereafter, in response to a further axial motion of interior element 17, 117, spreading element 16, 116 is spread apart radially in the direction of arrow A, so that the exterior circumference of spreading element 16, 116 under pressure contacts the interior circumference of outer tube 12, 112. In this state, the annular end face of cylindrical shoulder 38, 138 of spreading element 16, 116 has a specific, preestablished, slight distance a from inner limit stop surface 28, 128 of collar 32, 132. Then, inner tube 11, 111 being clamped in outer tube 12, 112 using a more or less high torque, if an impact-like axial stress is exerted

from outer tube 12, 112, which is provided, for example, with a handle, onto inner tube 11, 111, which is provided with a stick tip, then due to the clamping fixation of spreading element 16, 116 in outer tube 12, 112, interior element 17, 117 can move axially. This means that interior element 17, 117 moves further into interior cone 27, 127 of spreading element 16, 116, which leads to a further spreading of spreading element 16, 116 and therefore to an increase in the holding force between interior tube 11, 111 and outer tube 12, 112.